

## **Preliminary Draft - Do Not Cite or Quote**

### **Summary of Proposed Growth Factors for Agricultural Categories**

#### **Background**

On November 7, 2002, the Emission Inventory Subcommittee of the California Air Resources Board Agricultural Advisory Committee for Air Quality met to discuss the growth surrogates used in our California Emissions Forecasting System to forecast emissions from agricultural categories. The growth surrogates used for estimating the future emissions from pesticides, farm equipment, agricultural pumps, livestock waste, agricultural burning, and food and agricultural processing -- developed under contract by Pechan and Associates -- were presented to the Committee members. The growth factors ranged from a decrease of 13 percent in some food and agricultural processing emission categories to an increase of over 20 percent for livestock waste and agricultural pump emissions for the time period between 1999 and 2010 in the San Joaquin Valley. It was agreed that, where appropriate, an improved and consistent set of growth surrogates should be applied to these agricultural source categories to reflect projected decreases in agricultural lands. It was suggested that ARB staff contact the Department of Water Resources and analyze their future projections of water use on irrigated agricultural lands for use in forecasting air emissions.

#### **Current Growth Surrogate Assignments**

After completion of the 1994 State Implementation Plan for Ozone, the Air Resources Board hired Pechan and Associates to update the growth surrogates used in our California Emissions Forecasting System. Pechan provided a final report in 1998. Pechan relied on the forecasts of Regional Economic Models Inc. (REMI) for specific categories to develop its growth factors. REMI uses its model to forecast future trends of these categories based in their interaction with the California economy. This economic model outputs only a limited number of forecasted categories and from these, Pechan attempted to find those that best fit the historical trends of the various emission categories in the (ARB) inventory. The economic surrogates that best fit each inventory category were assigned as that inventory category's growth surrogate (see Attachment 9 of the October 18, 2002 letter sent to the Emission Inventory Subcommittee of the California Air Resources Board Agricultural Advisory Committee for Air Quality). If no suitable economic surrogate could be found, Pechan usually went with a default of No Growth for that category, deferring to ARB or the local air districts to come up with a growth surrogate if it was felt that a No Growth assignment was in error for that category.

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### **Proposed Growth Surrogates**

ARB staff recommends that the Department of Water Resources Bulletin 160 series projections for irrigated agricultural lands be used, where appropriate, as growth surrogates to reflect the projected decrease in agricultural lands for use in air emissions forecasting. We are proposing to use this new growth surrogate for the agricultural air emission source categories of agricultural pumps, farm equipment, agricultural burning, and pesticides.

### **Department of Water Resources Bulletin 160 series**

The Department of Water Resources (DWR) publishes the Bulletin 160 series, that assesses California's agricultural, environmental, and urban water needs and evaluates water supplies, in order to quantify the gap between future water demands and the corresponding water supplies.

### Quantifying Base Year Irrigated Acreage

Forecasts of agricultural acreage start with land use data that characterize existing crop acreage. DWR currently maps irrigated acreage in six to seven counties per year. The base data for land use surveys are obtained from aerial photography or satellite imagery, which is superimposed on a cartographic base. Site visits are used to identify or verify crop types growing in the fields. From this information, maps showing locations and acreage of crop types are developed.

DWR's land use surveys focus on quantifying irrigated agricultural acreage. Although fields of dry-farmed crops are mapped in the land use surveys, their acreage is not tabulated for calculating water use. In certain areas of the State, climate and market conditions are favorable for producing multiple crops per year on the same field (for example, winter vegetables followed by a summer field crop). In these cases, annual irrigated acreage is counted as the sum of the acreage of the individual crop types. In the years between county land use surveys, DWR estimates crop types and acreage using data collected from county agricultural commissioners, local water agencies, University of California Cooperative Extension Programs, and the California Department of Food and Agriculture.

### Forecasting Future Irrigated Acreage

DWR's 2020 irrigated acreage forecast was derived from staff research, a crop market outlook study, and results from the Central Valley Production Model. As with any forecast of future conditions, there are uncertainties associated with each of these approaches. DWR's integration of the results from three independent approaches is intended to represent a best estimate of future acreage, absent major changes from present conditions.

A key factor considered in making acreage forecasts is the urban encroachment onto agricultural land and land retirement due to drainage problems. Urbanization on lands presently used for irrigated agriculture is a significant consideration in

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the South Coast Region and in the San Joaquin Valley, based on projected patterns of population growth. DOF 2020 population forecasts, along with information gathered from agency land use plans, were used to identify irrigated lands most likely to be affected by urbanization. Local water agencies and county farm advisors were interviewed to assess their perspective on land use changes affecting agricultural acreage. For example, urbanization may eliminate irrigated acreage in one area, but shift agricultural development onto lands presently used as non-irrigated pasture. Soil types and landforms are important constraints in agricultural land development. If urbanization occurs on prime Central Valley farmland, some agricultural production may be able to shift to poorer quality soils on hilly lands adjoining the valley floor. A consequent shift in crop types and irrigation practices would likely result--for example, from furrow-irrigated row crops to vineyards on drip irrigation.

The Department's crop market outlook was developed using information and expert opinions gathered from interviews with more than 130 University of California farm advisors, agricultural bankers, commodity marketing specialists, managers of cooperatives, and others. The major findings for the year 2020 were that grain and field crop acreage would decrease, while acreage of truck crops and permanent crops would increase.

One factor not included in Bulletin 160-98 irrigated acreage forecasts is the potential large-scale conversion of agricultural land to wildlife habitat for reasons other than westside San Joaquin Valley problems. The CALFED program represents the largest pending example of potential conversion of irrigated agricultural lands to habitat. CALFED's potential land conversion amounts have not been included in the Bulletin 160-98 irrigated acreage forecast because they are preliminary at this time. Impacts of such land conversions are expected to be addressed in the next water plan update, when CALFED's program may be better defined.

Table 1 shows the 2020 irrigated acreage forecast for the San Joaquin River and Tulare Lake Hydrologic regions. The total irrigated crop acreage is forecasted to decline by 212,000 acres from 1995 to 2020. Reductions in crop acreage are due to urban encroachment, drainage problems in the westside San Joaquin Valley, and a more competitive economic market for California agricultural products.

DWR is in the process of updating the Bulletin 160 and expects to release an update by the end of 2003. After it is released, we will incorporate the refinements to the projections for irrigated agricultural lands into our California Emissions Forecasting System.

**Table 1. DWR Bulletin 160 - 98: California Water Plan**

| Irrigated Crop             | SJ & TL Acreage<br>(1,000 acres) |              | Change      |              |               |
|----------------------------|----------------------------------|--------------|-------------|--------------|---------------|
|                            | 1995                             | 2020         | Acreage     | %            | Annual Growth |
| Grain                      | 440                              | 353          | -87         | -19.8%       | -0.9%         |
| Rice                       | 22                               | 15           | -7          | -31.8%       | -1.5%         |
| Cotton                     | 1,211                            | 1,059        | -152        | -12.6%       | -0.5%         |
| Sugar beets                | 77                               | 31           | -46         | -59.7%       | -3.6%         |
| Corn                       | 328                              | 289          | -39         | -11.9%       | -0.5%         |
| Other field                | 217                              | 249          | 32          | 14.7%        | 0.6%          |
| Alfalfa                    | 527                              | 419          | -108        | -20.5%       | -0.9%         |
| Pasture                    | 248                              | 191          | -57         | -23.0%       | -1.0%         |
| Tomatoes                   | 193                              | 223          | 30          | 15.5%        | 0.6%          |
| Other truck                | 324                              | 497          | 173         | 53.4%        | 1.7%          |
| Almond/pistachios          | 428                              | 468          | 40          | 9.3%         | 0.4%          |
| Other deciduous            | 345                              | 352          | 7           | 2.0%         | 0.1%          |
| Subtropical                | 210                              | 225          | 15          | 7.1%         | 0.3%          |
| Grapes                     | 562                              | 549          | -13         | -2.3%        | -0.1%         |
| <b>Total Crop Area</b>     | <b>5,132</b>                     | <b>4,920</b> | <b>-212</b> | <b>-4.1%</b> | <b>-0.2%</b>  |
| <b>Multiple Crop</b>       | <b>119</b>                       | <b>180</b>   | <b>61</b>   | <b>51.3%</b> | <b>1.7%</b>   |
| <b>Irrigated Land Area</b> | <b>5,013</b>                     | <b>4,740</b> | <b>-273</b> | <b>-5.4%</b> | <b>-0.2%</b>  |

SJ: San Joaquin River Hydrologic Region

TL: Tulare Lake Hydrologic Region

#### **Base year (1995) acreage**

- Based on 1990 normalized acreage from Bulletin 160-93.
- Changes were evaluated to represent what would be expected in the absence of weather and market related abnormalities.
- The 1990 normalized acreage is based on surveyed data and evaluated changes between survey year and 1990.

#### **Forecasted 2020 acreage based on:**

- **Staff research** (the Federal Agriculture Improvement and Reform Act of 1996, urbanization)
- **Central Valley Production Model** (simulates farming decisions by growers; detailed information of practices, costs, water availability, prices as inputs)
- **Crop market outlook** (global demand; California share; technical factors, such as crop yields, pasture carrying capacities, and livestock feed conversion ratios)